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# PATENT SPECIFICATION

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## COMPLETE SPECIFICATION

### Improvements in or relating to Tobacco Smoke Filters

I, HEDWIG GAMBLE, a British Subject, of 19, Markham Street, London, S.W.3, do hereby declare this invention for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statements:—

This invention relates to tobacco smoke filters suitable for use in mouthpiece cigarettes. It is known to use crepe paper or cotton wool and the like, for such filters and these effect mainly a mechanical filtering action, with a subsidiary absorbing action when absorbing material is present. These materials are easily formed to a shape to fit or fill a cigarette paper tube and are unobjectionable whether in contact with the mouth or with the tobacco of a cigarette. Such filters, which are by far the most widely used, will be termed for distinction "physical" filters.

There is also a limited use for smoke filtering purposes of what are known as "chemical" filters, that is, filters comprising what are generally called "chemicals," for example, silica gel, or cotton wool impregnated with various chemicals and mainly relying for their action on other than mechanical filtering e.g. chemical combination or absorption. Chemical filters often comprise small crystals, granules, or like small solid masses of the chemical substance. The distinction between chemical filters and those defined as physical filters is well known in the trade.

It is known to use such crystal or granular filters in cigar or cigarette tips, the filter granules being arranged in a receptacle, such as a cartridge or case, made of solid material, such as plastic or glass and provided with suitable perforations in its ends. Such a cartridge or case is inserted in the smoke conduit of the tip or used in a holder or pipe. Whilst, however, with this method of use the same granule filter is, as a rule, used several times, for example, for smoking a number of cigarettes or cigars, in the present invention only a single use of the granular filter is con-

templated from which it will be seen that the production of the granular filter and in particular the material and production of the above-mentioned carrier or holder of the filter granules must be cheap and simple so as not to make the total cost too high.

Silica gel crystals are very effective as chemical filters and have been used in the above mentioned receptacles.

The main idea of the present invention is to put such filtering materials into the mouthpieces of cigarettes or cigarette paper tubes in order to utilise the extraordinarily high filtering action of these substances for ordinary mouthpiece cigarettes. Alternatively, they may be put in cardboard tubes, for use in holders and pipes.

The invention is based upon the appreciation that the fitting or introduction of chemical filters can be carried out in an economical manner in mouthpieces which are composed of a plurality of filter parts, such as a crepe paper filter or the like and a cotton wool wad or piece of wadding, as with these mouthpieces the addition of granular or crystal filters is relatively easy.

It is necessary to confine crystals or like masses so that they cannot fall out of a mouthpiece and it is desirable that such substances should be positioned some distance from the smoker's lips or they might produce harmful or unpleasant effects. This latter consideration also applies to chemical filters of the kind where an absorbent mass, say cotton wool, is impregnated with a chemical having filtering properties.

To achieve the objects of the invention loose crystals and like masses are held in a paper or cardboard tube in contact therewith between and by physical filters as above defined, or a porous substance, say cotton wool, either has crystals incorporated in it or is impregnated with a suitable chemical and is similarly held between and by physical filters.

For example, a multiple filter consisting of, say, two crepe plugs, or the equivalent, can

[Price 3s. 0d.]

Price 4s 6d

contain loose crystals in a space between the plugs, one plug serving to isolate the crystals from the user's lips.

5 The present invention therefore comprises a tobacco smoke filter consisting of a paper or cardboard tube containing a chemical filter in contact therewith, wherein the chemical filter is confined within the tube between and by  
10 physical filters, the whole filter assembly being adapted to be placed in a smoke conduit for the products of combustion of tobacco so that the smoke is constrained to pass through the chemical filter.

15 A filter according to the invention may be used as a filter mouthpiece for cigarettes or cigarette casings, that is, cigarette paper tubes of all kinds, which then constitute the paper tubes of the filters, whether the casings are to be used at once for ready-made cigarettes  
20 or whether they are to be marketed as tubes for later filling up. The casings may be provided with thin cardboard tubes, which then constitute the cardboard tubes of the filters.

25 In this way the pronounced filtering properties of certain already tested filter substances, such as silica gel or the like, are made available for the cigarettes or cigarette casings.

30 The present invention also comprises a mouthpiece cigarette, the mouthpiece whereof consists of a plurality of filter elements within the cigarette paper tube at least one of which is a chemical filter which contacts the tube and is located between and by two  
35 physical filter elements of the mouthpiece.

40 In this aspect of the invention, there will be in general, three elements to a mouthpiece, for example, the outer one is a crepe plug, with or without combined absorbent material, and the third or inner one, a cotton wool or like plug of wadding which is, for clarity,  
45 called hereafter a wad. Between these two there is a chemical filter which preferably consists of crystals or a granule substance suitable for filtering tobacco smoke. A suitable substance is silica gel. Impregnated cotton wool may be used instead as the chemical filter.

50 The invention also includes mouthpieces of this character the elements whereof are assembled in a cardboard tube ready to be inserted in a cigarette paper tube or incorporated with a piece of cigarette rod in any known manner; or used in pipes or holders.

55 Further, according to the invention there is provided a process for making cigarette paper tubes, or cardboard tubes, containing these multiple filters, thereby providing mouthpieces according to the invention.

60 Thus, filter mouthpieces made according to this aspect of the invention are characterised by the fact that between two physical filters of the mouthpiece there is provided a chemical filter such as a layer of granular or crystalline grains of a suitable filter substance, preferably  
65 silica gel, which layer is held or enclosed by

the other filter parts of the mouthpiece. These mouthpieces are manufactured according to a further feature of the invention in such manner that after the application of one of the  
70 physioal filters adjoining the chemical filter, or simultaneously with the fitting of said physical filter in the cigarette paper tube, the chemical filter is introduced and with it at the same time, or subsequently, the other  
75 physical filter is introduced.

The invention further includes apparatus for carrying out the above mentioned process of manufacture, examples of which are described later and specified in the appended claims.

80 The invention will be more fully described with reference to the accompanying drawings.

In the drawings:—

85 Fig. 1 shows a mouthpiece cigarette fitted with one form of a filter mouthpiece according to the invention.

Fig. 2 shows a cigarette paper tube provided with a similar filter mouthpiece, the parts whereof are enclosed in a cardboard tube.

90 Fig. 3 shows a side view of one embodiment of apparatus for carrying out the invention to produce the mouthpiece cigarette shown in Fig. 1.

95 Fig. 4 is a cross-section of Fig. 3 on the line IV—IV.

Fig. 5 shows on an enlarged scale and in section part of the apparatus shown in Fig. 3.

Fig. 6 is a view similar to Fig. 5 but showing the parts in a different position.

100 Fig. 7 is a diagram of a modified form of apparatus for carrying out the invention.

Fig. 8 is a detail of Fig. 7 in partial cross-section.

Fig. 9 is a partial plan view of Fig. 8.

105 Fig. 10 shows diagrammatically a third form of apparatus for carrying out the invention.

110 Fig. 11 is a diagram showing the feeding of pieces of chemically treated wool in apparatus of the kind shown in Fig. 3.

Fig. 12 shows an example of a filter mouthpiece where crystals are held in a carrier of porous material.

115 Figs. 13 to 16 show stages in the production of the granular filter of Fig. 12 using carrier material, consisting of a single strip, the filter granules being applied in continuous length or stream form.

120 Fig. 17 shows said production, also using a single enclosing strip but with the granules delivered thereto in separate portions.

125 Fig. 18 shows the said production using a single strip carrier with delivery of the filter granules in portions and the application of adhesive to the strip edges or, if desired, to the zones between the portions of granules.

130 Figs. 19 to 21 show the production of a granule filter using two strips, between which the filter granules are applied in continuous length or stream form.

Fig. 22 shows the production of a granular filter also using two strips but with the application of separate portions of filter granules.

Fig. 23 shows the same method of production as Fig. 22 but with adhesion of the strip edges and, if desired, the zones between the filter portions.

Fig. 24 shows the same method of production but with the joining of the edges of the strips by crimping.

Fig. 25 shows a method of production similar to that of Fig. 24 with the application in portions of the filter granules, crimping being also effected in the zones between the portions of granules.

Fig. 26 shows a further method of production of a granular filter where the filter granules are fixed substantially individually on a carrier strip.

Figs. 27 and 28 show the carrier for the filter granules shown in Fig. 26 after rolling or folding thereof into the finished granular filter length.

Fig. 29 shows on an enlarged scale a granular filter in which the filter granules are embedded in a highly porous carrier mass and Fig. 30 shows the production of filter bodies therefrom by stamping out separate filters from a plate or carrier mass previously cast in its entirety.

Figs. 31 and 32 show diagrammatically another way of making up the multiple filters.

Fig. 33 is a modification of Fig. 31.

In Figs. 1 and 2 there are shown two examples of the construction and arrangement of the filter mouthpiece of a cigarette and a cigarette paper tube respectively. According to Fig. 1 the mouthpiece fitted within and at the one end of the tubular paper casing 1 consists of filter parts 2 and 3 and a granular filter 4 located between and by them and contacting the casing 1. The filter part 2 is preferably formed in the usual way by a plug of rolled or folded crepe paper, whilst the filter part 3 is formed by a wad. The filter 4 consists preferably of silica gel crystals which are held loosely between the filter parts 2 and 3. It is evident that the filter parts 2 and 3 could also be made by plugs or pieces of other suitable physical filter material and that the grains or crystals could be replaced by other suitable chemical substances. The tobacco of the cigarette is shown at 1a. Fig. 2 shows a cigarette paper tube or casing 1 with a thin cardboard tube 5. The constitution of the filter within said tube is the same as in the cigarette represented in Fig. 1. The filled tube 5 could of course be prepared separately to be used in pipes and cigarette holders or with hand rolled cigarettes.

For the production of the mouthpiece according to Fig. 1, the apparatus shown in Figs. 3 and 4, by way of example, can be used.

In this apparatus two conveyor discs 6 and

7, set into intermittent rotation by suitable driving members, are provided, which discs, as Fig. 4 clearly shows, somewhat overlap and are side by side. The conveyor disc 6 has a row of holes 8 arranged in a circle concentric with the axis of the disc which holes are intended for the reception of crepe paper plugs 2 which are fitted in the holes by means of a device of any suitable kind, not shown on the drawing. The conveyor disc 7 likewise has holes 9 arranged in a circle which holes are intended to take wads 3, which wads are fitted in the holes by members known per se.

Close to the conveyor disc 7 is arranged a storage container 10 for the granules or crystals to form a chemical filter 4, Figs. 1 or 2. This container opens towards the bottom in proximity with the holes 9, as a narrow conduit 11; see also Figs. 5 and 6. The thickness of this conduit, i.e. the dimensions on Figs. 5 and 6, is such that it corresponds approximately to the desired thickness of the chemical filter. The conduit 11 is closed at the bottom by a flat slide 12 which is adjustable into either of two positions, these adjusted positions being fixed by a detent spring 13 which fits in one of two notches 14 in the slide. With the adjustment shown on the drawings a trough 15 of semi-circular form made on the inner end of the part 12 is concentric with the neighbouring hole 9. This is the normal working position of the slide for the insertion of the chemical filter 4. In the other position, in which the hole 16 of the slide is in alignment with the hole 9, the storage container 10 is completely closed at the bottom, so that the granules or crystals cannot reach the holes 9. The hole 16 of the slide 12 allows in this way for a plunger 17 to carry on working unhindered so that filters consisting only of the parts 2 and 3 can be made through such are not included in the present invention.

The holes 9 provided with wads 3 come consecutively into alignment with the trough 15 of the slide 12. Before one of the holes 9 reaches this position, the conduit 11 is filled, as shown by Fig. 5, with filter crystals out of the storage container 10. As soon as the hole 9 comes into line with the trough 15 of the slide 12, the plunger 17 forces the filter crystals located in front of its end face into the hole 9 (Fig. 6) the plunger 17 being only moved forward to such an extent that its end face comes flush with the rear surface of the conveyor disc 7. The conveyor disc 7 is now moved one stage onwards during which movement the fitted intermediate filter 4 is held in the hole 9 on the one hand by the wad 3, and on the other hand by a cover plate 18 located on the front face of the conveyor disc 7, which cover plate extends from the conduit 11 up to the edge of the conveyor disc 6, see Fig. 4. On the opposite face of the conveyor disc 7 there is provided a cover

plate 19 which prevents the wads 3 from coming out of the holes 9.

The subdivision of the holes 8 and 9 in the conveyor discs 6 and 7 and the operating movements of the two conveyor discs are so chosen, that at the position indicated by "A" a hole 8 and a hole 9 come into alignment. At this position there is provided a ramming device, not shown on the drawing, but constructed in the usual manner, by means of which the whole of the filter parts lying in a row at the point "A" namely plug 2, and wad 3, together with the chemical filter 4 are forced into the end of a cigarette paper tube 1, pushed on to the end of a spoon 20, whereby the physical filter parts and the chemical filter are brought into position within the paper tube 1 in the manner shown in Fig. 1.

The wall of the storage container 10 is made, at least partially, and, in particular, in the vicinity of the discharge conduit 11, flexible or movable and is subjected to the influence of a shaking device which ensures a shaking down on the granules or crystals out of the storage container 10 into the conduit 11, and a close superposing or packing of the filter granules in the conduit 11. In the embodiment shown, the wall part 10a of the storage container is movably supported by means of a hinge 21 and is provided at the bottom with a projection 22 which co-operates with the teeth of a toothed wheel 24 mounted on the shaft 23 of the conveyor disc 7 whereby, in conjunction with a spring 22a, a suitable shaking movement is imparted to the wall part 10a.

It will be understood that the above-described device can be modified in various ways without departing from the scope of the invention as set out in the appended claims. This holds good not only for the construction of the storage container 10, the closing of the discharge conduit 11, and the device for producing the shaking movement of the storage container or a part of the wall thereof, but in particular also for the sequence of the insertion of the filter parts. It would be possible for example to insert the crepe paper plugs 2 and the filters 4 in the holes of the conveyor disc 7 and then bring them, together with the wads 3 inserted, in this case, into the holes 8 of the conveyor disc 6, into alignment for pressing into the paper tube 1. This pressing of the filter parts into the tube would have to take place from the opposite side in order that the filter parts come into the relative positions shown by Fig. 1. Furthermore, it would be possible to use, in place of the crepe plugs and wads, other known substances used as physical filters for these filter parts.

In the case of the embodiment of the device shown in Figs. 7 to 9, it is assumed that cigarette paper tubes are each previously provided with a thin cardboard mouthpiece 5

such as that shown in Fig. 2 and furthermore that one filter part, e.g., the wad 3 is already inserted in such a position in the cardboard mouthpiece that it comes at the outer end of the cardboard mouthpiece as can be seen in Fig. 9. The tubes so prepared are placed in a container or hopper 30 from which they fall consecutively into grooves or flutes 31 of an intermittently moved conveyor drum 32. Close to the container 30 there is provided a storage container 10 for the granules or crystals of the chemical filter 4, the discharge outlet of which as can be seen from Fig. 8, lies over the edge of a disc 33 which is provided on its circumference with grooves 34. The grooves 34 take out of the storage container 10 a definite portion of filter granules or filter crystals and move in the same way as the grooves 31 of the drum 32. The grooves of the disc 33 are spaced by the same pitch as the grooves 31 of the drum 32. At the point "A" which is shown on a larger scale on Fig. 8, there are now aligned a paper tube 1 and a portion of chemical filter 4 in front of a rammer device 35 by means of whose rammer 36 a crepe paper plug 2 previously fitted in the rammer device 35 is forced, together with the filter 4 and the wad 3 into the cardboard mouthpiece 5, as is shown in Fig. 9. In the region of the point "A" there is arranged, above the circumference of the grooved drum 32, a holding-down device 37 which temporarily presses the paper tube 1 and the cardboard mouthpiece 5 firmly in the corresponding groove 31 and thereby prevents a shifting of the tube or of the cardboard mouthpiece during the insertion of the filter parts. In front of and behind the discharge outlet of the storage container 10, viewed in the circumferential direction of the disc 33, there are arranged cover plates 38 which prevent the granules or crystals placed in the grooves 34 of the disc 33 from coming out. The hole and flute for the plug and crystals respectively, are shown small intentionally in Fig. 8 for clearness but in fact the plug is only a trifle smaller than the interior of the tube 5 and will expand to fit it when free to do so.

Cigarette paper tubes of the form shown in Fig. 2 can be produced by the device shown diagrammatically in Fig. 10. Here it is assumed that the cigarette paper tubes 1 are previously provided with cardboard mouthpieces 5 and with paper plugs 2. The paper tubes so prepared are moved past by a conveyor 40 in a vertical position under the discharge of the storage container 10 for the granules or crystals of the chemical filter when, each time and by a suitably constructed dosing device 41, a definite quantity of granules or crystals of the layer 4 is allowed to fall into the tube 1. The tubes then come to a rammer device 42 by means of which a wad 3 is inserted from the open end into the tubes 1. It

will be apparent that any one of the constructions shown can be used to put filters into a cardboard tube for use in holders and pipes.

When the chemical filter consists of chemically impregnated wool or other amorphous substances it will be clear that the feeding device will require modification although in general the conduit 11 or an equivalent device will be used.

A diagrammatic illustration of a suitable device is shown in Fig. 11. In this view the parts already shown in Fig. 5 bear the same references, but the conduit 11 has been modified so it is marked 111. Also the crystals 4 have been replaced by wool pieces which are marked 104. The conduit 111 is arranged so that it is vertically above the hole 9 (see Fig. 4) at reference 15 in which assembly of the impregnated wool with the wad already in said hole takes place. Pieces of impregnated wool are cut from a continuous strip 43 by knives 44 and drop down the conduit in front of the plunger 17. This pushes each piece into a hole 9, compressing the wad as it does so.

In Fig. 12 there is shown by way of example how a chemical filter consisting of a wrapped granular filter 204 is used with a mouthpiece filter consisting of several parts, the granular filter being fitted in the casing 1 approximately between a retaining filter plug 2 of crepe paper of the like and a retaining wadding plug or "wad" 3 adjoining the tobacco filling.

Production of such granule filters can, for example, be carried out as shown in Fig. 13 where there is applied on a suitable strip 57 of material and in the central zone of this strip, a continuous length or stream 58 of filter granules, whereupon the strip is then, and preferably in a continuous process, closed round the stream of granules. The stages of this closing operation of the surrounding strip are shown by Figs. 14, 15 and 16. The filter length produced in this manner is subsequently divided, as by cutting, into individual filters, and these individual filters are inserted in the casings of mouthpieces. Care must of course be taken when inserting the filters in a paper tube 1 as in Fig. 12 to see that the open ends thereof come to rest against the curved wall of the tube.

A better closing of the open ends of the individual filters can be attained, as shown by Fig. 17, if the filter granules are applied in individual portions 58a on the strip 57, suitable distances being left between the portions of granules. The subdivision of the resulting filter length takes place in the zones between the portions of granules so that by means of local crushing of the strip material taking place, for example on the cutting, a complete closing of the covering is attained. This complete closing can be facilitated, according to Fig. 18 by the application both on the longitudinal edges of the enclosing strips

57 as also in the vicinity of the zones between the portions of granules 58a of a strip-like insert 59 or 60 of adhesive substance such as glue whereby the holding together of the surrounding rolled up strip 57 and a satisfactory and firm closing of the ends of the separated individual filters are ensured. It is naturally understood that the separation of the individual filters from the prepared filter length takes place in such manner that the dividing cut falls approximately in the centre of the glued strip 60.

The method of production above described, is suitable in particular, for strips of soft material such, for example, as cotton, wadding, cellulose wadding, soft cellulose, or the like.

According to Fig. 19 the production of the granular filters takes place in such manner that the filter granules are applied in the form of a continuous length 58, between a base strip 61 and a covering strip 62, whereupon the two strips 61 and 62 are rolled together preferably in a continuous process.

Fig. 20 shows in cross-section the two enclosing strips and the filter granules located between them whilst Fig. 21 shows the rolled-up filter length. The prepared filter length is then, as in the case of the above-described processes, subdivided into the individual filters. Here, also, a better closing of the ends of the individual filters can be obtained by the filter granules according to Fig. 22 being inserted in the form of individual portions 58a between the enclosing strips 61 and 62. As shown in Fig. 23 the use of an adhesive is particularly suitable where separated portions of granules are used and there are applied at the longitudinal edges of one or of both the surrounding strips 61 and 62, a strip-shaped insertion 59 and, if necessary, also between the portions of granules 58a, a strip-shaped insertion 60 of adhesive material which in the vicinity of the said zones ensures a firm holding together of the enclosing strips 61 and 62.

For this method of production, strips of any desired suitable material for example wadding, cellulose, porous crepe paper, textile fabric, organdine, or the like, can be utilised, and either the same material can be used for both strips or, if desired, the strips can be of different materials.

According to Figs. 24 and 25 with certain substances for the enclosing strips 61 and 62, instead of sticking the edges together they may be crimped; the corresponding zones of the strips being pressed together by milled rollers, whereby a firm mutual adherence of the strip in the vicinity of the corresponding zones is attained. In an embodiment according to Fig. 24 a crimped border 63 is provided only on the longitudinal edges of the strips 61 and 62, whilst in the embodiment according to Fig. 25 crimping 64 is applied simultaneously transversely of the strips at suitable positions



between the portions of granules 58a.

Of particular importance in the selection of the carrier material is the existence of a sufficiently large porosity for the passage of the smoke and the material must possess adequate strength for its purpose. The use of woven or worked textile substances, for example, organdie, for the carrier has the advantage that not only are the above-mentioned conditions fulfilled but also fine dust from the granules, which might eventually lead to a caking together of the filter granules, can fall out through the comparatively wide meshes of the carrier and therefore only grains having a definite minimum size will remain in the filter.

It is also possible to join enclosing strips, instead of by sticking or crimping, by sewing them together; for example in the region of the zones between the portions of granules, parallel seams could be made between which the separation of the filter length by the subdivision thereof into the individual filters can be effected.

A further possibility in the production of the granule filter is also that of fastening or fixing the filter granules, as far as possible individually and preferably by adhesion, on to a carrier made of paper, crepe paper, cellulose, wadding or the like, the carrier being later formed into a plug. Fig. 26 shows such a strip-shaped carrier 70 with filter granules 71 which are stuck on, in the main separately. This sticking on can take place by first providing the carrier 70 with a very thin coating of adhesive on to which are then spread or strewn the filter granules. Then, as shown in Figs. 27 and 28 the carrier 70 is rolled or folded in order to form a length enclosing the filter granules which subsequently is suitably subdivided.

According to a further feature of the invention, it is also possible to retain the filter granules in a particular position with respect to each other and with respect to the mouthpiece by embedding the filter granules 71 in a highly porous carrier body 72, as shown in Fig. 29. The production of such filter bodies can be carried out in such a manner that a liquid carrier mass impregnated with granules of filter substance is made porous by frothing, blowing, or the like, and then simultaneously with the complete or partial solidification, or after this solidification, portions of the mass are brought into the desired form suitable for the filter mouthpieces. As shown in Fig. 30, the procedure could be that from a plate-shaped carrier body 73 previously made with embedded filter granules, the individual filters 74 are stamped out. It is also possible to make continuous carrier bodies e.g. of cylindrical cross section which can be subdivided into individual filters.

The apparatus shown in Figs. 31 and 32 which illustrate another way of making the

filters, comprises a drum indicated by the reference 75 and made up of five side-by-side sections or discs 76, 77 and 78. The central section 76 has a circle of holes 79 in it, aligned with a similar circle of holes 80 in the discs 78. Each hole 79 is suitable to take a double-length plug. The discs 77 each have a circle of flutes, the flutes 90 being concentric with the holes 79 and 80. The flutes are to receive crystals discharged from chutes 81. The holes 80 are to receive wads. Shrouds 82 covers the flutes for nearly 90° of the drum circumference to prevent crystals from falling out of the flutes. The drum moves intermittently and at one position, for instance at 83, a crepe plug is pushed through the outer discs at one side into the centre section. Such a plug is indicated by vertical hatching. At the top position, crystals fall into the flutes and a little later say at 84 the wads are pushed into the holes 80. The wads might of course be pushed in at say, 85 before the crystals enter the aligned flutes. In both cases wads are indicated by horizontal hatching, dots being used at 85. When a line of holes and flutes loaded in this manner, reaches the discharge position at 86, the shrouds 82 end and are replaced by curved lugs 87. A push rod (not shown) moves through the line of holes and flutes and pushes the assembly through a spoon into a paper or thin cardboard tube in the usual manner.

In Fig. 33 all the drum sections are fluted. Shrouds 82 control the crystals as before while shrouds 89 of larger radius control plugs and wads. This arrangement permits plugs and wads to be fed to the drum by lateral instead of axial movements.

The product of either Fig. 31 or Fig. 32 is a piece consisting of a double-length plug, at each end of which is a portion of crystals followed by a wad. This product is bisected to produce two composite filter elements. It will be readily seen that any of the filter products described can be used for other purposes in smoking, for example in pipes adapted for use with filters and in cigars, cigarette holders and refills for same, handrolled cigarettes and separate mouthpieces used with cigarettes and cigars.

The term small masses, will apply to crystals or granules and this term is therefore used in the appended claims. Tobacco smoke filters made according to this invention are cheap enough to be thrown away after using once and are therefore suitable for use in cigarettes.

What I claim is:—

1. A tobacco smoke filter consisting of a paper or cardboard tube containing a chemical filter in contact therewith wherein the chemical filter is confined within the tube between and by physical filters.

2. A filter as claimed in claim 1 wherein the chemical filter is located between a crepe paper filter and a wad.



3. A filter as claimed in claim 2 wherein the chemical filter comprises small masses of a chemical substance of known kind used for tobacco smoke filtering.
- 5 4. A filter as claimed in claim 1 wherein the chemical filter comprises small masses of a chemical substance of known kind used for tobacco smoke filtering and held in a carrier of porous material.
- 10 5. A filter as claimed in any one of the preceding claims wherein the chemical filter comprises silica gel.
6. A filter as claimed in claim 1 wherein the chemical filter comprises an absorbent material impregnated with a chemical substance.
- 15 7. A filter as claimed in any one of the preceding claims wherein the tube is a cigarette paper tube.
- 20 8. A filter as claimed in any one of the preceding claims 1 to 6 wherein the tube is a cardboard tube and is contained within a cigarette paper tube.
- 25 9. A mouthpiece cigarette comprising a tobacco smoke filter as claimed in claim 1.
10. Apparatus for making filters as claimed in claim 3 comprising two overlapping intermittently rotatable discs each provided with a ring of holes arranged in a circle concentric with the disc axis, said holes being so arranged that those of one disc come successively into alignment with those of the other disc, means for inserting filter plugs into the holes of both discs and means for feeding small masses of chemical substance into the holes of one disc so that said masses enter the holes from that face of the disc which is contiguous with a face of the other discs and means for ejecting aligned plugs and masses from the discs when the holes containing these elements are in alignment and inserting them into a tube.
- 30 35 40 45 11. Apparatus for making filters as claimed in claim 3 wherein the elements of a filter are contained in a cardboard tube which is contained within a cigarette paper tube, comprising a hopper from which cigarette paper tubes each containing a cardboard tube within which is a filter plug are removed by a fluted drum, a fluted disc coaxial with the drum and having flutes in alignment with those of the drum, means for feeding small masses of chemical substance to the flutes of the disc and a plunger movable to push a further filter plug through a disc flute and into the cardboard tube which is held in the drum flute which is aligned with said disc flute, thereby also pushing the chemical substance in the disc flute into the cardboard tube.
- 50 55 60 65 70 75 80 85 90 95 12. Apparatus for making filters as claimed in claim 3 and wherein the elements of a filter are contained in a cardboard tube which is contained within a cigarette paper tube, comprising a conveyor in which cigarette paper tubes already provided with cardboard tubes each containing a crepe paper plug are held vertically with the plug at the lower end and moved thereby beneath a source of supply of small masses of chemical substance and means for regulating the quantity of such substance which falls into the cardboard tube, the conveyor thereafter moving each loaded tube beneath a reciprocating spoon which enters the upper end of the tube and through which a rammer feeds in a further filter plug.
13. Apparatus for making filters as claimed in claim 3 comprising two discs having flutes in their rims and means to feed small masses of chemical substance into the flutes, the discs being coaxially arranged on either side of a drum adapted to contain double-length filter plugs in axial alignment with said flutes, a further disc outside each fluted disc and coaxial therewith, these outer discs being adapted to contain single length filter plugs in axial alignment with said flutes, and means for ejecting the aligned plugs and masses from the apparatus into a tube, which is thereafter bisected to provide two filters.
14. Apparatus for making tobacco smoke filters, substantially as herein described with reference to Figs. 3 to 11 and 31 to 33 of the accompanying drawings.
15. Tobacco smoke filters substantially as herein described with reference to Figs. 1, 2 and 12 of the accompanying drawings.
- HERBERT J. W. WILDBORE,  
101, Leadenhall Street, London, E.C.3,  
Agent for the Applicant.

## PROVISIONAL SPECIFICATION

No. 4128 A.D. 1953.

## Improvements in or relating to Cigarettes

I, HEDWIG GAMBLE, a British Subject, of 19, Markham Street, London, S.W.3, do hereby declare this invention to be described in the following statement:—

100 This invention relates to cigarettes.

It is already known to use in cigarettes and cigarette tips, smoke filters of granular or crystalline filter materials, in particular silica gel crystals, these as a rule being con-

tained in small receptacles with perforated end walls and located in the smoke conduit. 105

The basic idea of the present invention is to put such filtering materials into the mouthpieces of cigarettes or cigarette paper tubes in order to utilise the extraordinarily high filtering action of these substances, for ordinary mouthpiece cigarettes, the invention is based upon the appreciation that this fitting or 110

introduction of the filters can be carried out in an economical manner particularly in those known mouthpieces which are composed of a plurality of filter parts, such as a crepe paper filter or the like and a wad or piece of wadding, as with these mouthpieces the fitting of the granular or crystal filters is possible without the use of cartridges or the like.

The present invention comprises a mouthpiece cigarette, the mouthpiece whereof consists of a plurality of filter or like elements, at least one of which is a chemical filter and is located between two other filter elements of the mouthpiece. In view of its position this chemical filter will be hereafter termed an intermediate filter.

The term filter or like elements is used because some materials, such as crepe paper (alone), are not regarded as true filters, though crepe is widely used for mouthpiece cigarettes.

In general there will be three elements to a mouthpiece, for example, the outer one is a crepe plug, with or without combined filtering material, and the third or inner one, a cotton wool or like plug of wadding which is, for clarity, called hereafter a wad. Between these two there is a chemical or intermediate filter which preferably consists of crystals or granular substances suitable for filtering tobacco smoke. A suitable substance is silica gel. Impregnated cotton wool is also contemplated.

The invention also includes mouthpieces of this character which may be assembled in a cardboard tube ready to be inserted in a cigarette paper tube or incorporated with a piece of cigarette rod in any known manner.

Further, according to the invention there is provided a process for making cigarette paper tubes, or a cardboard tube containing these filters thereby providing mouthpieces according to the invention.

Thus filter mouthpieces according to the invention are characterised by the fact that between two filters of the mouthpiece there is provided an intermediate filter layer of granular or crystalline grains of suitable filter substances, preferably silica gel, which layer is therefore held or enclosed by the other filter parts of the mouthpiece. These mouthpieces are manufactured according to a further feature of the invention in such manner that after the application of one of the filter parts adjoining the intermediate filter, or simultaneously with the fitting of said part in the cigarette paper tube, the intermediate filter is introduced and with it at the same time, or subsequently, the other filter part is also introduced.

The invention further includes apparatus for carrying out the above-mentioned process. The preferred form of embodiment of such a device, which has the advantage of being suitable for the addition to already existing cigarette or cigarette paper tube machines, is

characterised by the provision of two conveyor discs each with a row of holes arranged in a circle, concentric with the disc axis, the holes of the two discs meeting intermittently and consecutively. The holes of one conveyor disc are arranged to take the one filter part, e.g., the wad and the grains or crystals of the intermediate filter which are delivered in portions from a storage container, whilst the holes of the other conveyor disc are intended for the reception of the other filter parts, e.g., the crepe paper plug, and at the place where two holes, one in each disc, are in alignment a filling device of usual construction is provided which inserts the filter parts together with the intermediate filter into the cigarette tube. The storage container for the grains of the intermediate filter preferably opens into a narrow conduit connecting laterally with a hole on the first-mentioned conveyor disc and into this conduit there moves a plunger or the like which forces forward a definite quantity of grains out of the conduit into the hole already closed at one end by one filter part.

According to a further characteristic of the invention the device may be constructed for carrying out the process according to the invention in particular for the production of cigarette paper tubes with a carton or pasteboard mouthpiece holding the filter parts, in such manner that it comprises a conveyor preferably constructed as a grooved drum taking the prepared cigarette tubes provided with carton tubes and a filter part (e.g. the wad) pushed forward up to the outer end of the tube on the front side of which drum there is provided a disc whose periphery is carried past beneath the outlet of a storage container for the granules or crystals of the intermediate filter, and provided with grooves to take definite portions of the intermediate filter, a plunger device being provided by means of which the second filter part (e.g. crepe paper plug), can be pressed into the paper tube during which movement the wad and intermediate filter are moved towards the inner end of the cardboard tube.

Such cigarette paper tubes or filter mouthpieces could, however, be manufactured by means of a device which has a conveyor which moves the prepared cigarette tubes provided with carton mouthpieces and filter parts (e.g. crepe paper plug already fitted therein and which closes an end of the paper tube) in a practically vertical position past the outlet of a storage container for the granules or crystals of the intermediate filter, when by means of a dosing arrangement a definite portion of the intermediate filter is allowed to fall into each cigarette tube whereupon at another position of the conveyor and by means of a plunger device the second filter part is forced into the tube and the intermediate filter is thereby enclosed.

Further details are given in the following

description in which the invention is explained with reference to the accompanying drawings.

In the drawings:—

5 Fig. 1 shows a mouthpiece cigarette fitted with a filter mouthpiece according to the invention,

Fig. 2 shows a cigarette paper tube provided with a similar filter mouthpiece, the parts whereof are enclosed in a cardboard tube.

10 Fig. 3 shows a side view of one embodiment of apparatus for carrying out the invention.

Fig. 4 is a cross-section of Fig. 3 on the line IV—IV.

15 Fig. 5 shows on an enlarged scale and in section part of the apparatus shown in Fig. 3.

Fig. 6 is a view similar to Fig. 5 but showing the parts in a different position.

Fig. 7 is a diagram of a modified form of apparatus for carrying out the invention.

20 Fig. 8 is a detail of Fig. 7 in partial cross-section.

Fig. 9 is a partial plan view of Fig. 8.

25 Fig. 10 shows diagrammatically a third form of apparatus for carrying out the invention.

In Figs. 1 and 2 there are shown two examples of the construction and arrangement of the filter mouthpiece of a cigarette and a cigarette paper tube respectively. According to Fig. 1 the mouthpiece fitted at the one end of the paper casing 1 consists of filter parts 2 and 3 and a granular intermediate filter 4 located between them. The filter part 2 is preferably formed in the usual way by a plug of rolled or folded crepe paper, whilst the filter part 3 is formed by a wad. The intermediate filter 4 consists preferably of silica gel crystals which are held loosely between the filter parts 2 and 3. It is evident that the filter parts 2 and 3 could also be made by plugs or pieces of other suitable filter material and that the grains or crystals could be replaced by other suitable chemical substances. The tobacco of the cigarette is shown at 1a.

35 Fig. 2 shows a cigarette paper tube or casing 1 with a carton or cardboard tube 5. The constitution of the filter within said tube is the same as in the cigarette represented in Fig. 1.

50 For the production of the mouthpiece according to Fig. 1 the apparatus shown in Figs. 3 and 4, by way of example, can be used.

55 In this apparatus two conveyor discs 6 and 7, set into intermittent rotation by suitable driving members, are provided, which discs, as Fig. 4 clearly shows, somewhat overlap and are side by side. The conveyor disc 6 has a row of holes 8 arranged in a circle concentric with the axis of the disc which holes are intended for the reception of crepe paper plugs 2 which are fitted in the holes by means of a device of any suitable kind, not shown on the drawing. The conveyor disc 7

likewise has holes 9 arranged in a circle which holes are intended to take wads 3, which wads are fitted in the holes by members known per se.

70 Close to the conveyor disc 7 is arranged a storage container 10 for the granules or crystals to form an intermediate filter 4. This container opens towards the bottom in proximity with the holes 9, as a narrow conduit 11; see also Figs. 5 and 6. The thickness of this conduit, i.e. the dimension on Figs. 5 and 6, is such that it corresponds approximately to the desired thickness of the intermediate filter. The conduit 11 is closed at the bottom by a flat slide 12 which is adjustable into either of two positions, these adjusted positions being fixed by a detent spring 13 which fits in one of two notches 14 in the slide. With the adjustment shown on the drawings a trough 15 of semi-circular form made on the inner end of the part 12 is concentric with the neighbouring hole 9. This is the normal working position of the slide for the insertion of the intermediate filter 4. In the other position, in which the hole 16 of the slide is in alignment with the hole 9, the storage container 10 is completely closed at the bottom, so that the granules or crystals cannot reach the holes 9. The hole 16 of the slide 12 allows in this way for a plunger 17 to carry on working unhindered so that filters consisting only of the parts 2 and 3 can be made.

100 The holes 9 provided with wads 3 come consecutively into alignment with the trough 15 of the slide 12. Before one of the holes 9 reaches this position the conduit 11 is filled, as shown by Fig. 5, with filter crystals out of the storage container 10. As soon as the hole 9 comes into line with the trough 15 of the slide 12, the plunger 17 forces the filter crystals located in front of its end face into the hole 9 (Fig. 6) the plunger 17 being only moved forward to such an extent that its end face comes flush with the near surface of the conveyor disc 7. The conveyor disc 7 is now moved one stage onwards during which movement the fitted intermediate filter 4 is held in the hole 9 on the one hand by the wad 3, and on the other hand by a cover plate 18 located on the front face of the conveyor disc 7, which cover plate extends from the conduit 11 up to the edge of the conveyor disc 6, see Fig. 4. On the opposite face of the conveyor disc 7 there is provided a cover plate 19 which prevents the wads 3 from coming out of the holes 9.

125 The subdivision of the holes 8 and 9 in the conveyor discs 6 and 7 and the operating movements of the two conveyor discs are so chosen, that at the position indicated by A a hole 8 and a hole 9 come into alignment. At this position there is provided a ramming device, not shown on the drawing, but constructed in the usual manner, by means of

which the whole of the filter parts lying in a row at the point A, namely plug 2, wad 3, together with the intermediate filter 4, are forced into the end of a cigarette paper tube 1, pushed on to the end of a spoon 20, whereby the filter parts and the intermediate filter are brought into position within the paper tube 1 in the manner shown in Fig. 1.

The wall of the storage container 10 is made, at least partially, and, in particular, in the vicinity of the discharge conduit 11, flexible or movable and is subjected to the influence of a shaking device which ensures a shaking down of the granules or crystals out of the storage container 10 into the conduit 11, and a close superposing or packing of the filter granules in the conduit 11. In the embodiment shown, the wall part 10a of the storage container is movably supported by means of a hinge 21 and is provided at the bottom with a projection 22 which co-operates with the teeth of a toothed wheel 24 mounted on the shaft 23 of the conveyor disc 7 whereby, in conjunction with a spring 22a, a suitable shaking movement is imparted to the wall part 10a.

It will be understood that the above-described device can be modified in various ways without departing from the scope of the invention. This holds good not only for the construction of the storage container 10, the closing of the discharge conduit 11, and the device for producing the shaking movement of the storage container or a part of the wall thereof, but in particular also for the sequence of the insertion of the filter parts. It would be possible for example to insert the paper plugs 2 and the intermediate filters 4 in the holes of the conveyor disc 7 and then bring them, together with the wads 3 inserted, in this case, into the holes 8 of the conveyor disc 6, into alignment for pressing into the paper tube 1. This pressing of the filter parts into the tube would have to take place from the opposite side in order that the filter parts come into the relative positions shown by Fig. 1. Furthermore, it would be possible to use, in place of the crepe plugs and wads, other substances for these filter parts.

In the case of the embodiment of the device shown in Figs. 7 to 9, it is assumed that cigarette paper tubes are each previously provided with a carton mouthpiece 5 such as that shown in Fig. 2 and furthermore that one filter part, e.g. the wad 3, is already inserted in such a position in the carton mouthpiece that it comes at the outer end of the carton mouthpiece as can be seen in Fig. 9. The tubes so prepared are placed in a container or hopper 30 from which they fall consecutively into grooves or flutes 31 of an intermittently moved conveyor drum 32.

Close to the container 30 there is provided a storage container 10 for the granules or crystals of the intermediate filter 4, the discharge outlet of which, as can be seen from Fig. 8, lies over the edge of a disc 33 which is provided on its circumference with grooves 34. The grooves 34 take out of the storage container 10 a definite portion of filter granules or filter crystals and move in the same way as the grooves 31 of the drum 32. The grooves of the disc 33 are spaced by the same pitch as the grooves 31 of the drum 32. At the point A which is shown on a larger scale on Fig. 8, there are now aligned a paper tube 1 and a portion of intermediate filter 4 in front of a rammer device 35 by means of whose rammer 36 a paper plug 2 previously fitted in the rammer device 35 is forced, together with the intermediate filter 4 and the wad 3 into the carton mouthpiece 5, as is shown in Fig. 9. In the region of the point A there is arranged, above the circumference of the grooved drum 32, a holding-down device 37 which temporarily presses the paper tube 1 and the carton mouthpiece 5 firmly in the corresponding groove 31 and thereby prevents a shifting of the tube or of the carton mouthpiece during the insertion of the filter parts. In front of and behind the discharge outlet of the storage container 10, viewed in the circumferential direction of the disc 33, there are arranged cover plates 38 which prevent the granules or crystals placed in the grooves 34 of the disc 33 from coming out.

Cigarette paper tubes of the form shown in Fig. 2 could also be produced by the device shown diagrammatically in Fig. 10. Here it is assumed that the cigarette paper tubes 1 are previously provided with carton mouthpieces 5 and with paper plugs 2. The paper tubes so prepared are moved past by a conveyor 40 in a vertical position under the discharge of the storage container 10 for the granules or crystals of the intermediate filter when, each time and by a suitably constructed dosing device 41, a definite quantity of granules or crystals of the intermediate layer 4 is allowed to fall into the tube 1. The tubes then come to a rammer device 42 by means of which a wad 3 is inserted from the open end into the tubes 1.

When the intermediate filter consists of chemically impregnated wool or other amorphous substances it will be clear that the feeding device will require modification although in general the conduit 11 or an equivalent device will be used.

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## PROVISIONAL SPECIFICATION

No. 6885 A.D. 1953.

## Improvements in or relating to Tobacco Smoke Filters

I, HEDWIG GAMBLE, a British Subject, of 19, Markham Street, London, S.W.3, do hereby declare this invention to be described in the following statement:—

5 This invention relates to tobacco smoke filters and an object of the invention is to provide a filter containing crystals or granules of suitable chemical substances enclosed or otherwise held in a carrier made of such  
10 materials that the product is cheap enough to be thrown away after being used once. Thus a filter of this nature can be employed in mouthpiece cigarettes.

15 According to the invention there is provided a tobacco smoke filter comprising granules or crystals of a suitable filter material, for example silica gel, said granules being held in a carrier made of naturally porous material. Naturally porous material means a  
20 substance such as a textile which has pores through which smoke can pass and does not include any substance which is impervious to smoke and needs to be provided with holes for the passage of smoke.

25 The invention further refers to a filter mouthpiece for cigarettes or cigarette casings, that is, cigarette paper tubes of all kinds, independently of whether the casings are to be used at once for ready-made cigarettes or  
30 whether they are to be marketed as tubes for later filling up and independently of whether the casings are provided with carton mouthpieces or not. The mouthpiece filter may consist only of one part or of a plurality of  
35 different parts.

The invention therefore includes cigarettes or casings comprising said mouthpieces.

40 In this way the pronounced filtering properties of certain already tested filter substances, such as silica gel or the like, are made available for the cigarettes or cigarette casings.

45 It is known to use crystal filters in cigar or cigarette tips, the filter granules being arranged in a cartridge or case provided with suitable perforations. Such a cartridge or case is inserted in the smoke conduit of the tip. Whilst, however, with this method of use the  
50 same granule filter is, as a rule, used for smoking a number of cigarettes or cigars, in the present invention only a single use of the granular filter is contemplated from which it will be seen that the production of the granular filter and in particular the material  
55 and production of the above-mentioned carrier or holder of the filter granules must be cheap and simple so as not to make the total cost of the casings or of the mouthpiece filters too high.

60 The invention includes several embodiments of granular filter and of processes for the production thereof which will provide cheap and efficient filters.

65 In some embodiments of the invention, a definite quantity of filter granules is placed loosely within a carrier inserted in the mouth-  
70 piece, this carrier consisting for example of wadding, cellulose, porous crepe paper, textile fabric, organtine, or the like, either separately or as a combination of these materials. Such granular filters can be made in such manner  
75 that the filter granules are applied loosely in a continuous stream, or in separate portions, on a strip of suitable width of the enclosing material, for example wadding, cellulose and  
80 the like, the strip being then preferably closed as a continuous length and the length so formed being subdivided into individual filters as by cutting. The edges of the enclosing strip  
85 and if necessary, the zones located between the portions of granules can be provided with a coating of adhesive in order to obtain a complete closure of the resulting product. Alternatively, in the production of these  
90 granular filters, the filter granules can be applied in continuous form, or in individual portions, upon a strip of material whereupon a second strip of the same, or of a different  
95 porous material, superposed and the granules are enclosed for example by crimping the edges of the two strips, and the filter length so obtained is suitably subdivided. In this process  
100 it is also possible to combine the superposed strip with the other strip at the edges and if necessary also between the portions of granules, either simultaneously with the super-  
105 posing, by application of adhesive, or subsequently, for example by folding the edges of the strips over or by crimping.

110 Instead of the sticking, folding, or crimping, any other method of connection such, for example, as sewing can be used in all cases.

115 By the subdivision or cutting up of the filter length made in the above-mentioned manner, individual filters are formed in which the filter granules are partially or entirely enclosed in the carrier. That is the ends of the granule carrier may be partly open, or closed, according to the sticking or cutting operations performed. In consequence of the complete closing  
120 of the carrier or covering of the filter granules, or by the suitable insertion of a partially closed carrier in the mouthpiece for example the open ends of the carrier are caused to rest against the curved mouthpiece  
125 wall, the holding of the filter granules within the carrier is ensured and the possibility of the subsequent falling out thereof is prevented.

The production of the granular filter may also be effected according to the invention by the filter granules being fastened on to a carrier consisting of paper, crepe paper, cellulose, wadding or the like, which is thereafter formed into a suitable plug, the granules being attached in the main, individually, and preferably by the use of adhesive.

The desired retention of the filter granules could also, for example, be attained by the granules being embedded in a highly porous carrier and preferably in such manner that the carrier mass amalgamated with the granules is made porous, for example by frothing up or blowing up, and then brought into a shape adapted for the mouthpiece simultaneously with the whole or partial solidification of the mass or after this solidification.

Further details of the invention will be found in the following description in which the invention is further explained with reference to the accompanying drawings.

In the drawings:—

Figs. 1 and 2 show two examples of filter mouthpieces.

Figs. 3 to 6 show stages in the production of the granular filter using carrier material, consisting of a single strip, the filter granules being applied in continuous length or stream.

Fig. 7 shows the production, also using a single enclosing strip but with the delivery of the granules thereto in separate portions.

Fig. 8 shows the production also with a single strip with delivery in portions of the filter granules and the application of adhesive to the strip edges or, if desired, to the zones between the portions of granules.

Figs. 9 to 11 show the production of the granule filter using two strips, between which the filter granules are applied in continuous length or stream form.

Fig. 12 shows the production of the granular filter also using two strips but with the application of separate portions of filter granules.

Fig. 13 shows the same method of production as Fig. 12 but with adhesion of the strip edges and, if desired, the zones located between the filter portions.

Fig. 14 shows the same method of production but with the joining of the edges of the strips by crimping.

Fig. 15 shows a method of production similar to that of Fig. 14 with application of portions of filter granules, crimping being also effected in the zones between the portions of granules.

Fig. 16 shows a further method of production of the granular filter where the filter granules are fixed substantially individually on a carrier strip.

Figs. 17 and 18 show the carrier for the filter granules shown in Fig. 16 after rolling or folding thereof into the final granular filter length.

Fig. 19 shows on an enlarged scale a

granular filter in which the filter granules are embedded in a highly porous carrier mass and Fig. 20 shows the production of such filter bodies by stamping out separate filters from a plate or carrier mass previously cast in its entirety.

As already explained at the outset, the use of the granular filter according to the invention is in no way to be restricted to particular types of casing mouthpieces or cigarette filter mouthpieces.

In Fig. 1 there is shown by way of example, how a granular filter 204 is used with a mouthpiece filter consisting of several parts, the granular filter being fitted in the casing 1 approximately between a filter plug 2 of crepe paper or the like, and a wadding plug or "wad" 3, adjoining the tobacco filler 1a. No claim is made to this combination which is covered by the copending application No. 4128/53. It is also possible to use the granular filter only together with a single further filter part, say the paper plug 2, or the wad 3 alone. Furthermore, it is possible to use the granular filter 204 as shown in Fig. 2. In Fig. 2 there is shown the use of the granular filter with a mouthpiece comprising a tube 5 of thin cardboard or the like.

In order to retain the granules within the granule filter and to prevent them from falling out of the mouthpiece, there is provided according to the invention a carrier for the filter granules, which consists of a suitable porous material surrounding the filter granules.

Production of such granule filters can, for example, be carried out as shown in Fig. 3 where there is applied on a suitable strip 57 of material and in the central zone of this strip, a continuous length or stream 58 of filter granules, whereupon the strip is then, and preferably in a continuous process, closed round the stream of granules. The stages of this closing operation of the surrounding strip are shown by Figs. 4, 5 and 6. The filter length produced in this manner is subsequently divided, as by cutting, into individual filters, and these individual filters are inserted in the casings or mouthpieces. Care must, of course, be taken when inserting the filters to see that the open ends thereof come to rest against the curved wall of the mouthpiece.

A better closing of the open ends of the individual filters can be attained, as shown by Fig. 7, if the filter granules are applied in individual portions 58a on the strip 57, suitable distances being left between the portions of granules. The subdivision of the resulting filter length takes place in the zones between the portions of granules so that by means of local crushing of the strip material taking place, for example on the cutting, a complete closing of the covering is attained. This complete closing can be facilitated, according to Figure 8, by the application both on the longitudinal edges of the enclosing strip



57 as also in the vicinity of the zones between the portions of granules 58a, of a strip-like insertion 59 or 60 of adhesive substance such as glue whereby the holding together of the surrounding rolled up strip 57 and a satisfactory and firm closing of the ends of the separated individual filters are ensured. It is naturally understood that the separation of the individual filters from the prepared filter length takes place in such manner that the dividing cut falls approximately in the centre of the glued strip 60.

The method of production above described, is suitable in particular, for strips of soft material such, for example, as cotton, wadding, cellulose wadding, soft cellulose, or the like.

According to Fig. 9 the production of the granular filters takes place in such manner that the filter granules are applied in the form of a continuous length 58, between a base strip 61 and a covering strip 62, whereupon the two strips 61 and 62 are rolled together preferably in a continuous process.

Fig. 10 shows in cross-section the two enclosing strips and the filter granules located between them whilst Fig. 11 shows the rolled-up filter length. The prepared filter length is then, as in the case of the above-described processes, subdivided into the individual filters. Here, also, a better closing of the ends of the individual filters can be obtained by the filter granules according to Fig. 12 being inserted in the form of individual portions 58a between the enclosing strips 61 and 62. As shown in Fig. 13 the use of an adhesive is particularly suitable where separated portions of granules are used and there are applied at the longitudinal edges of one or of both the surrounding strips 61 and 62, a strip-shaped insertion 59, and, if necessary, also between the portions of granules 58a, a strip-shaped insertion 60 of adhesive material which in the vicinity of the said zones ensures a firm holding together of the enclosing strips 61 and 62.

For this method of production, strips of any desired suitable material for example wadding, cellulose, porous crepe paper, textile fabric, organtine, or the like, can be utilised, and either the same material can be used for both strips or, if desired the strips can be of different materials.

According to Figs. 14 and 15, with certain substances for the enclosing strips 61 and 62 instead of sticking the edges together they may be crimped; the corresponding zones of the strips being pressed together by milled rollers, whereby a firm mutual adherence of the strips in the vicinity of the corresponding zones is attained. In the embodiment according to Fig. 14, a crimped border 63 is provided only on the longitudinal edges of the strips 61 and 62, whilst in the embodiment according to Fig. 15 crimping 64 is applied simultaneously transversely of the strips at suitable positions

between the portions of granules 58a.

Of particular importance in the selection of the carrier material is the existence of a sufficiently large porosity for the passage of the smoke and the material must possess adequate strength for its purpose. The use of woven or worked textile substances, for example organdie, for the carrier has the advantage that not only are the above-mentioned conditions fulfilled but also fine dust from the granules, which might eventually lead to a caking together of the filter granules, can fall out through the comparatively wide meshes of the carrier and therefore only grains having a definite minimum size will remain in the filter.

It is also possible to join the enclosing strips, instead of by sticking or crimping, by sewing them together; for example in the region of the zones between the portions of granules, parallel seams could be made between which the separation of the filter length by the subdivision thereof into the individual filters can be effected.

A further possibility in the production of the granule filter is also that of fastening or fixing the filter granules, as far as possible individually and preferably by adhesion, on to a carrier made of paper, crepe paper, cellulose, wadding or the like, the carrier being later formed into a plug. Fig. 16 shows such a strip-shaped carrier 70 with filter granules 71 which are stuck on, in the main separately. This sticking on can take place by first providing the carrier 70 with a very thin coating of adhesive on to which are then spread or strewn the filter granules. Then, as shown in Figs. 17 and 18, the carrier 70 is rolled or folded in order to form a length enclosing the filter granules which subsequently is suitably subdivided.

According to a further feature of the invention, it is also possible to retain the filter granules in a particular position with respect to each other and with respect to the mouthpiece by embedding the filter granules 71 in a highly porous carrier body 72, as shown in Fig. 19. The production of such filter bodies can be carried out in such manner that a liquid carrier mass impregnated with granules of filter substance is made porous by frothing, blowing, or the like, and then simultaneously with the complete or partial solidification, or after this solidification, portions of the mass are brought into the desired form suitable for the filter mouthpieces. As shown in Fig. 20, the procedure could be that from a plate-shaped carrier body 73 previously made with embedded filter granules, the individual filters 74 are stamped out. It is also possible to make continuous carrier bodies e.g. of cylindrical cross section which can be subdivided into individual filters.

Instead of rolling up a single web or joining two webs to form a carrier for the crystals,



a single wide web can be used and folded on its mid-width. The granules can then be deposited on one half and the other half folds over.

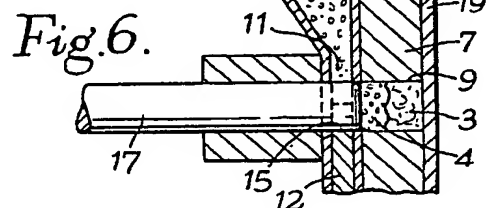
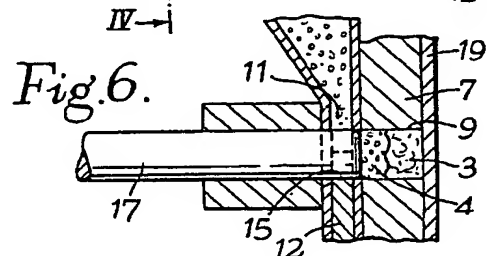
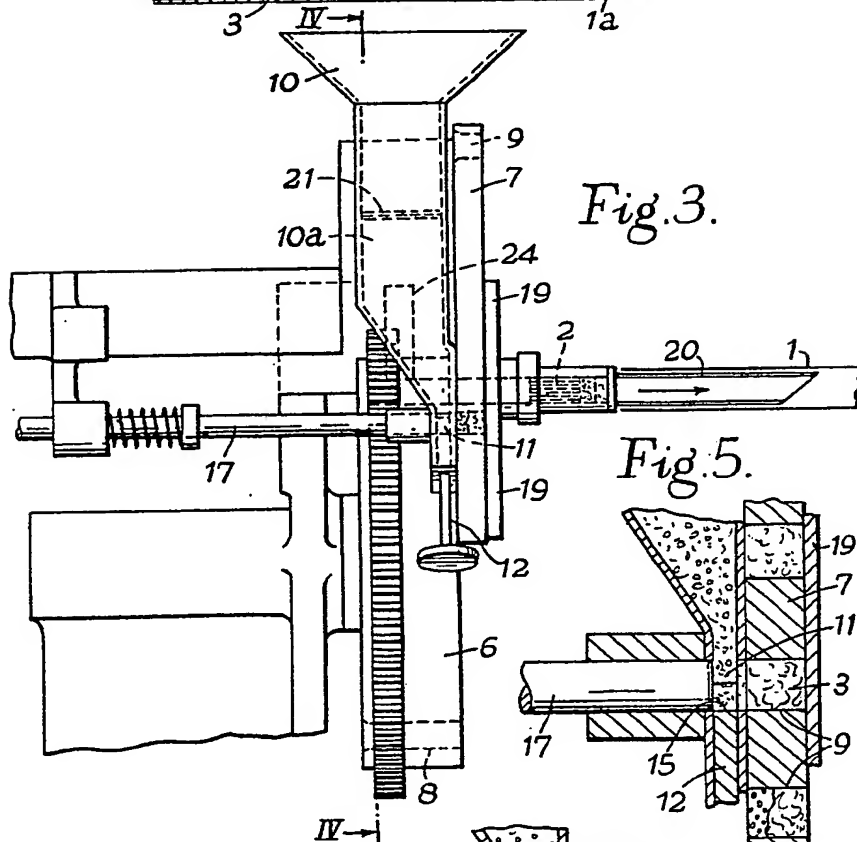
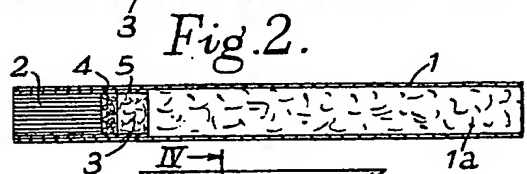
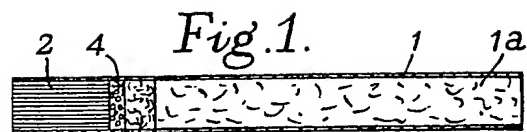
- 5 Where two webs, or a folded web as just described, are used the filter length can be reeled up on a bobbin for further treatment later (e.g. in assembly) provided that the product is kept fairly flat. This reeled material  
10 can be brought to a fairly round section if necessary by unreeing it and passing it through a suitable former before separating it into individual filters.

- 15 In another method of manufacture, a drum made up of five side-by-side sections or discs is used. The central section has a circle of holes in it, each suitable to take a double length crepe plug. At each side of the central section is a disc with a circle of flutes, each  
20 concentric with a hole of said section. These flutes are to receive crystals. The outer discs have holes just like the central section. These holes receive wads. Shrouds cover the flutes for a suitable distance to prevent crystals from

falling out. The drum moves intermittently 25 and at one station the crepe plug is pushed into the centre from the outside of the drum. At another station crystals fall into the flutes and a little later wads are pushed in the holes 30 in the outer discs. When a line of holes and flutes loaded in this manner reaches a discharge position the shrouds end and are replaced by curved segments which with the curves of the flutes, form complete circles. A push rod 35 moves through the row of holes and flutes and pushes the assembly into a paper tube held on a spoon. It is also possible to use five fluted sections to form the drum. This permits direct loading of all the flutes. Five 40 shrouds are provided, three of such radius as to permit plugs and wads to move beneath and two of smaller radius to hold the crystals. The product in both cases will be a piece which can be divided centrally to produce two 45 triple filters with crystals in the middle.

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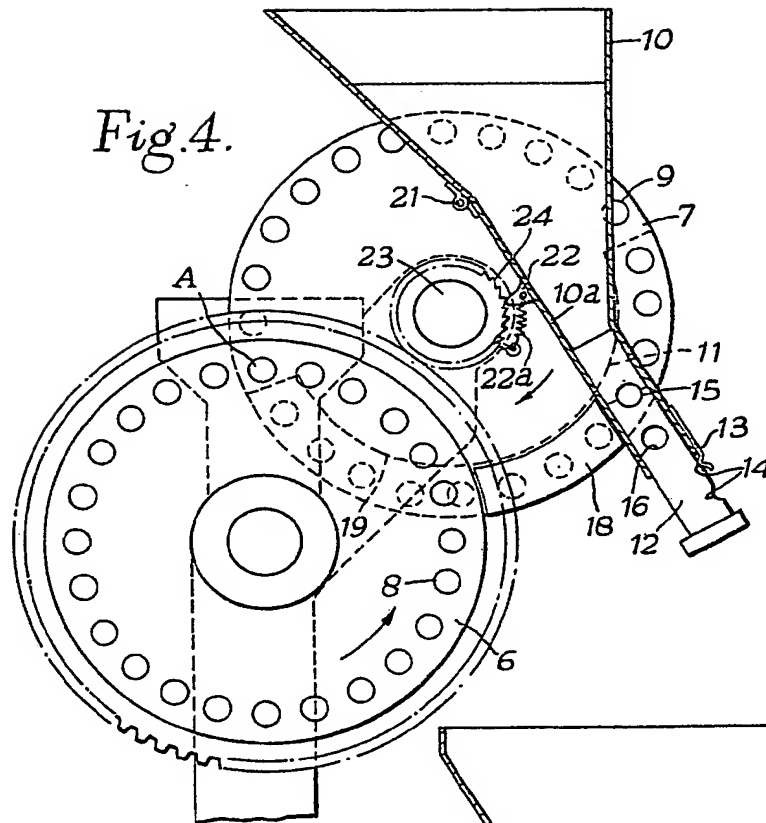
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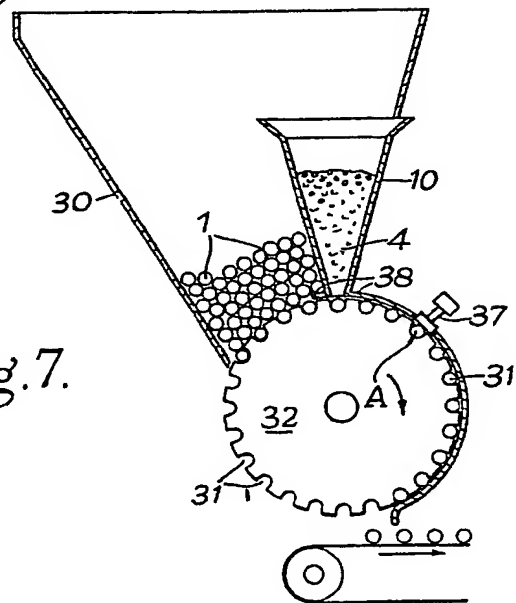
6 SHEETS

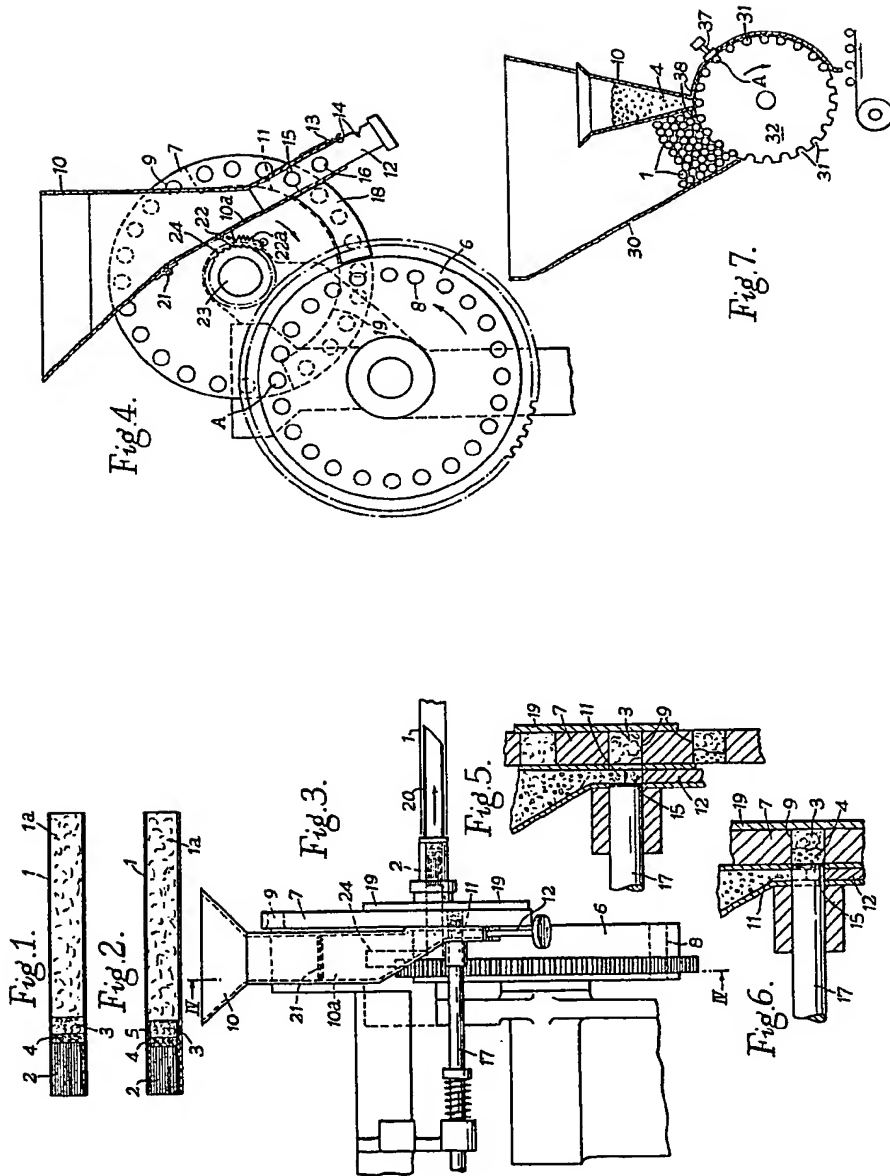
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the Original on a reduced scale.

SHEETS 1 & 2



*Fig. 7.*





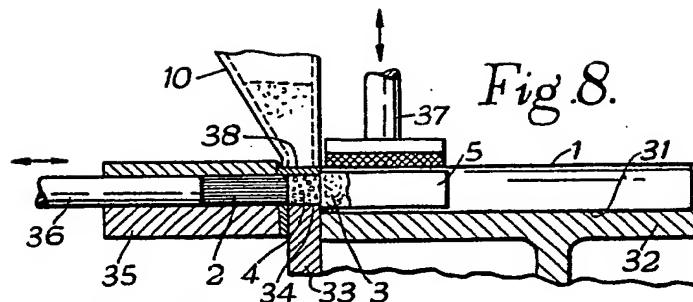


Fig. 8.

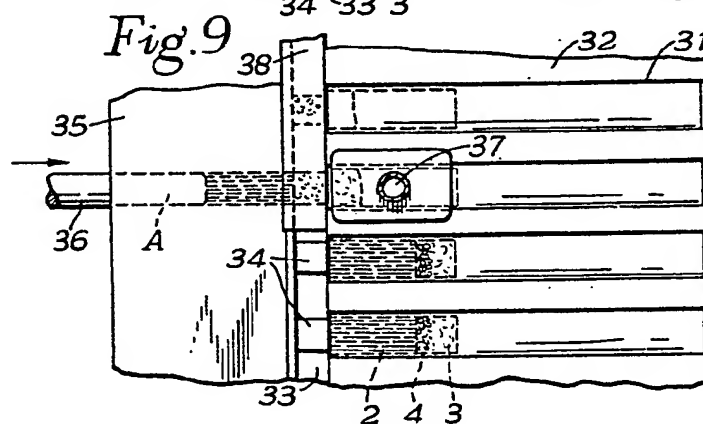


Fig. 9.

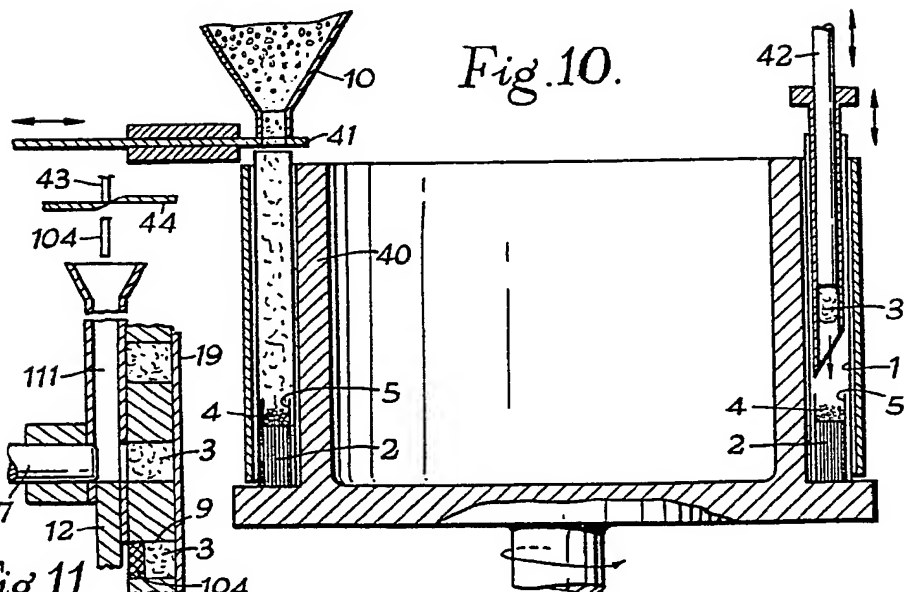


Fig. 10.

Fig. 11.

741,429

COMPLETE SPECIFICATION

6 SHEETS

This drawing is a reproduction of  
the Original on a reduced scale.  
SHEETS 3 & 4

Fig.12.

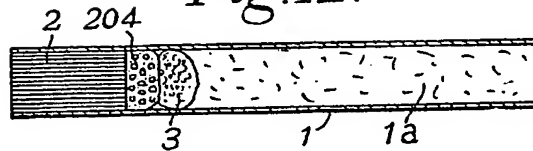


Fig.14.

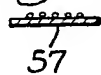


Fig.15.



Fig.13.

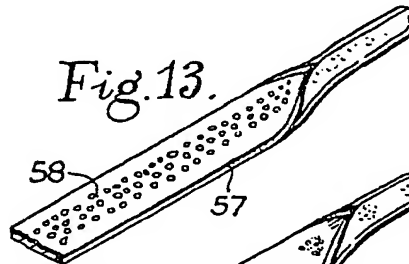


Fig.16.



Fig.17.

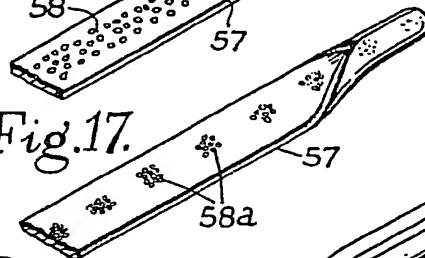


Fig.18.

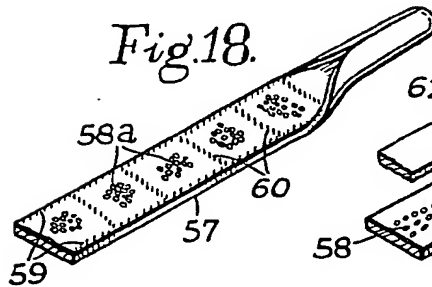


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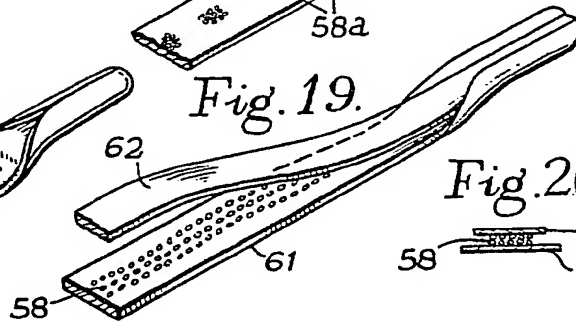


Fig.20.

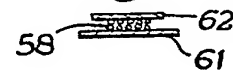


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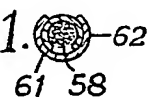


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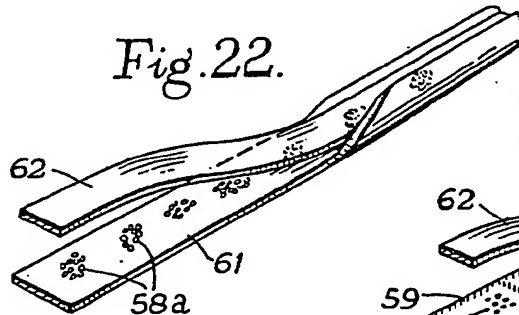


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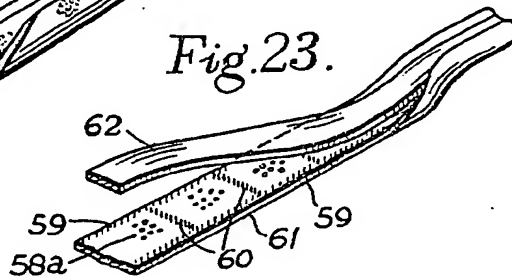


Fig. 12.

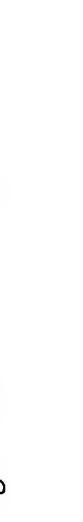
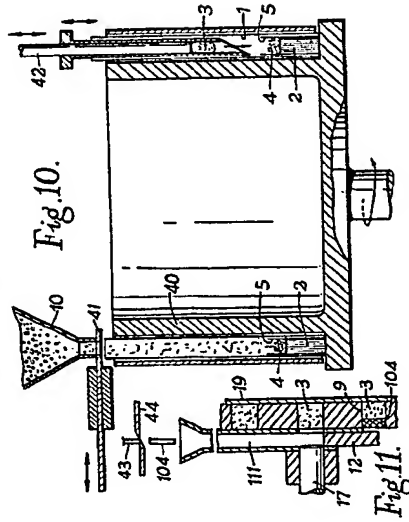
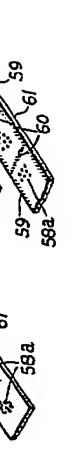
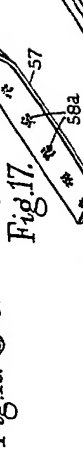
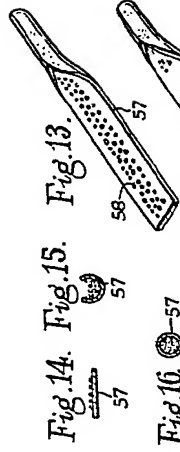
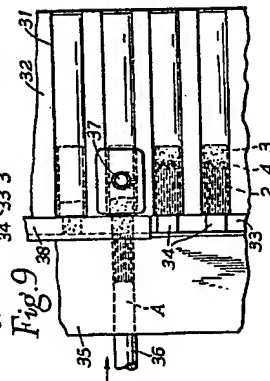
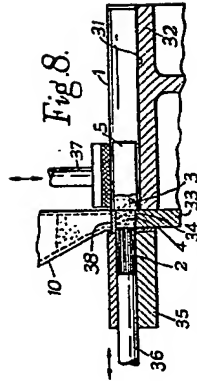




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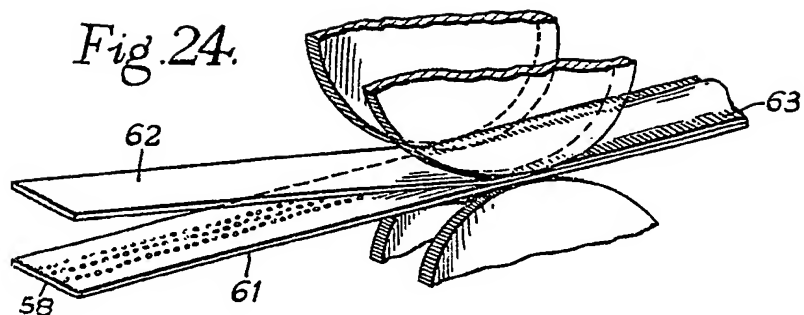


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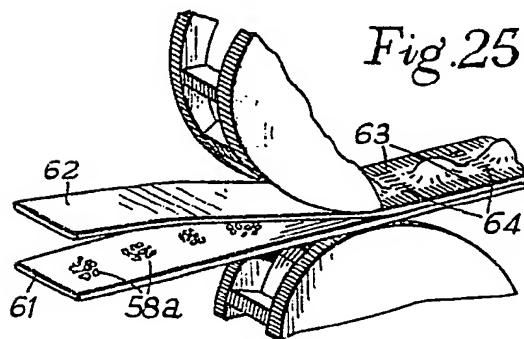


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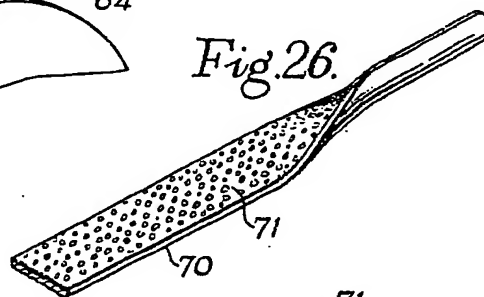


Fig.27.



Fig.28.



Fig.29.

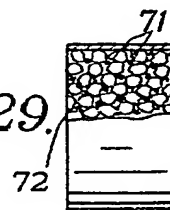
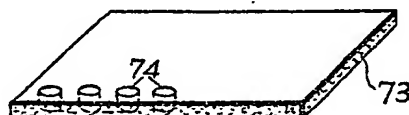


Fig.30.

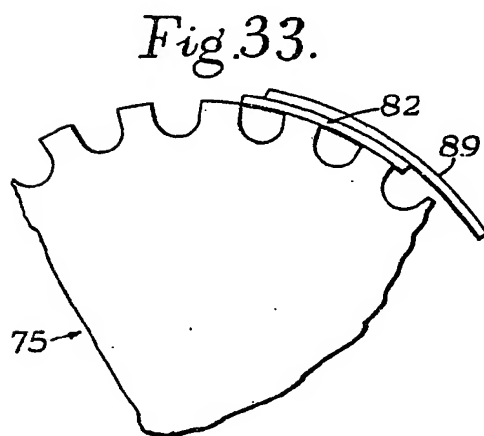
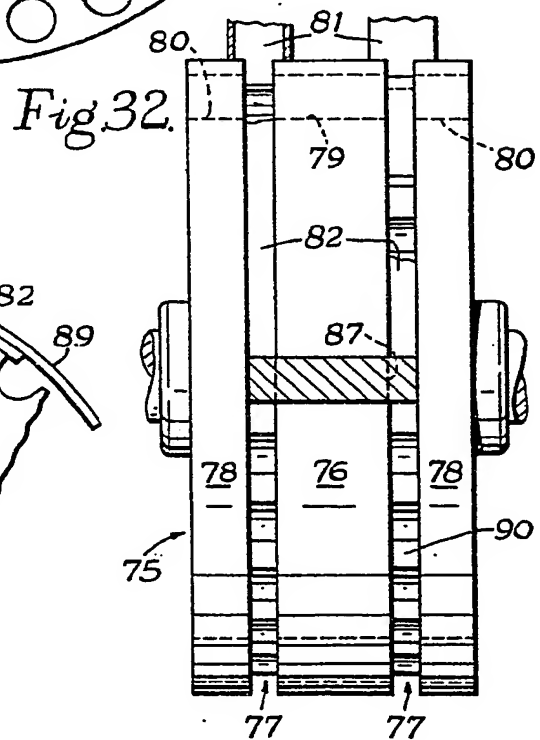
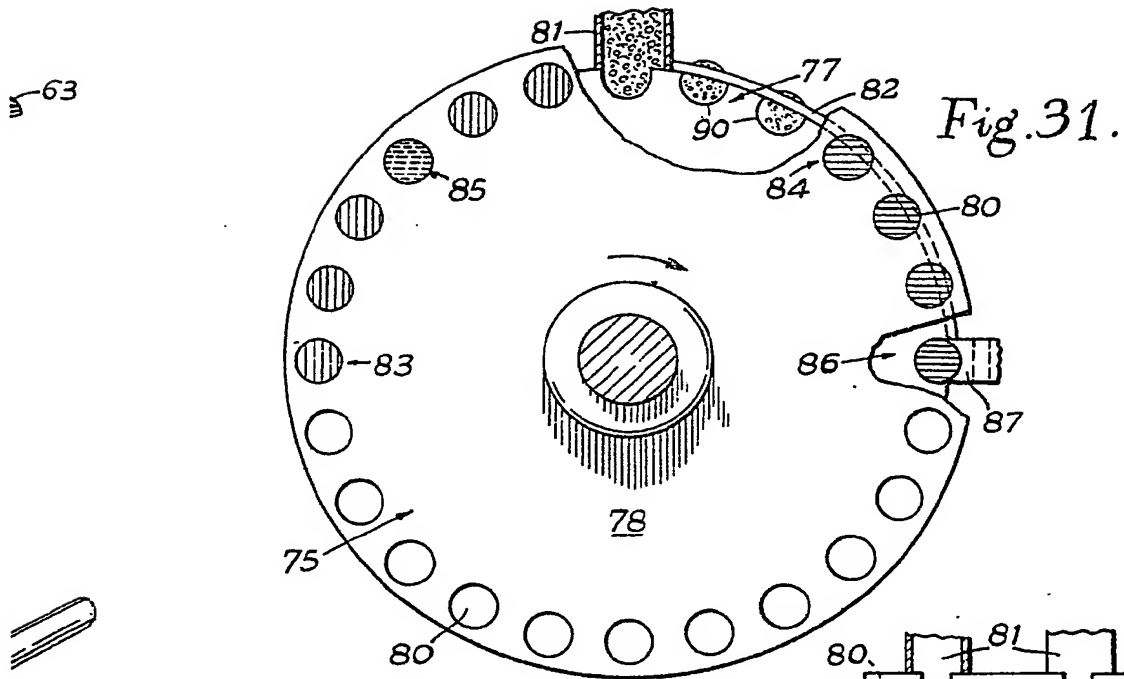


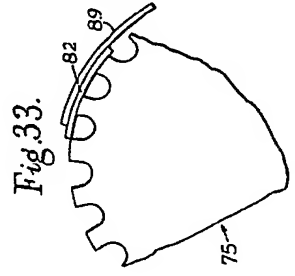
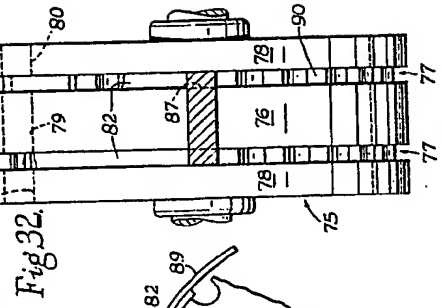
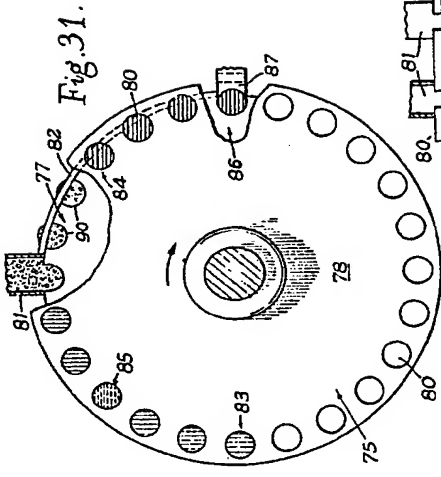
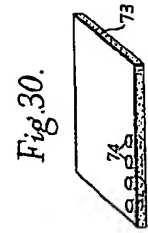
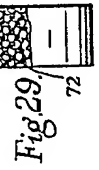
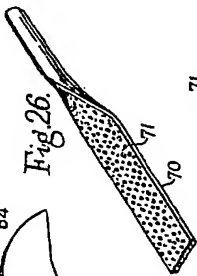
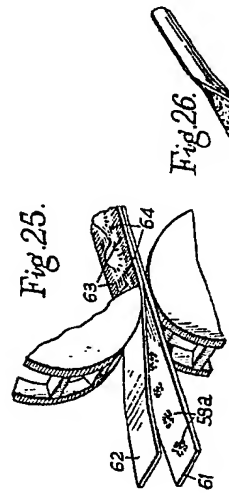
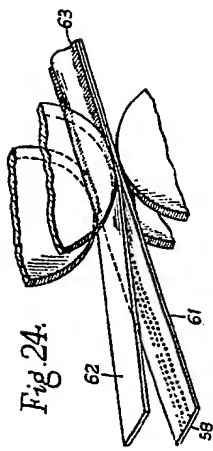
741,429 COMPLETE SPECIFICATION

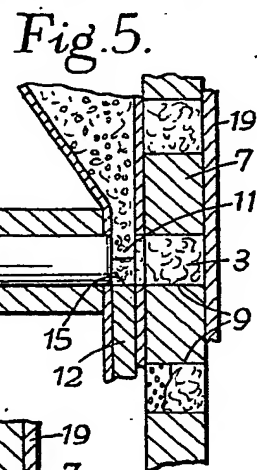
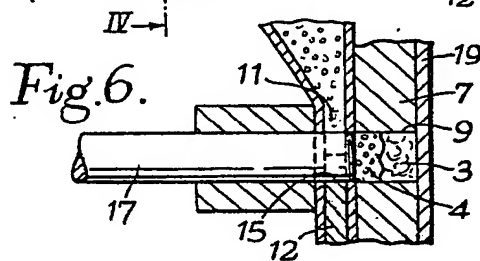
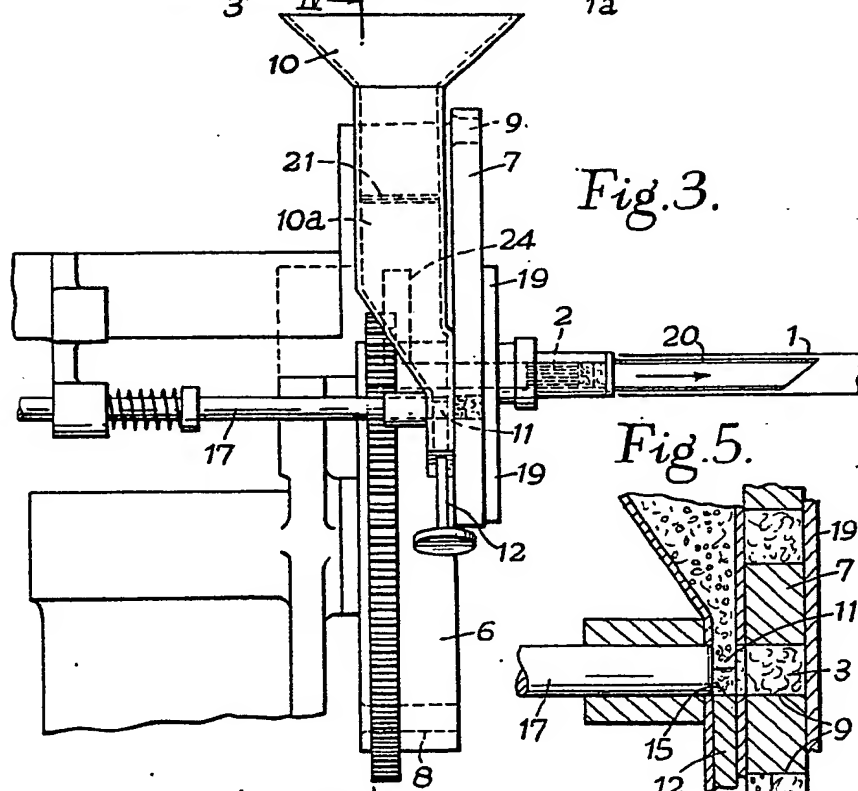
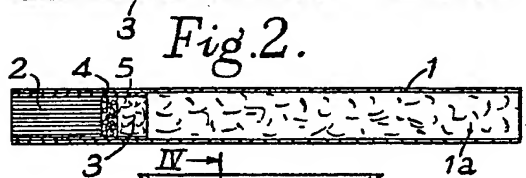
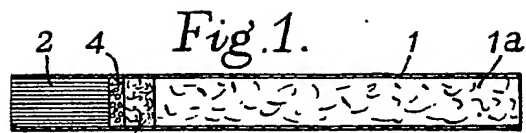
6 SHEETS

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the Original on a reduced scale.

SHEETS 5 & 6







741,429

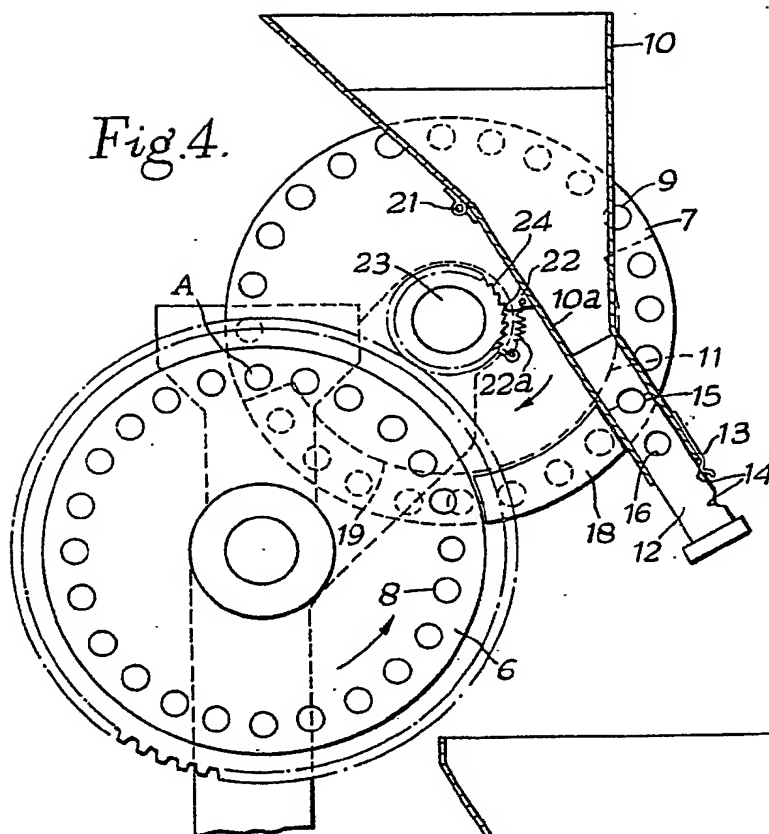
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3 SHEETS

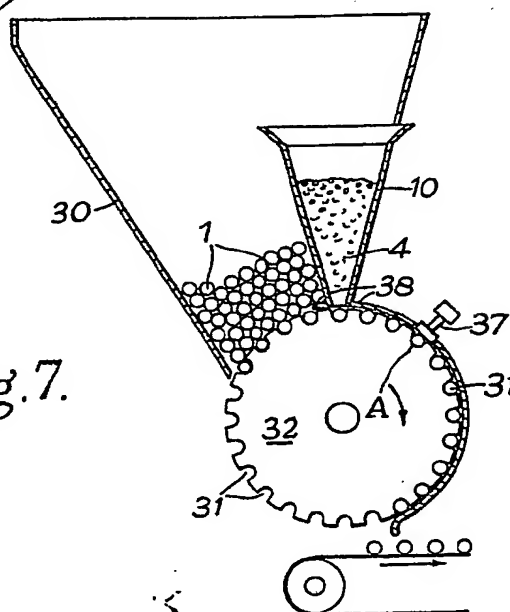
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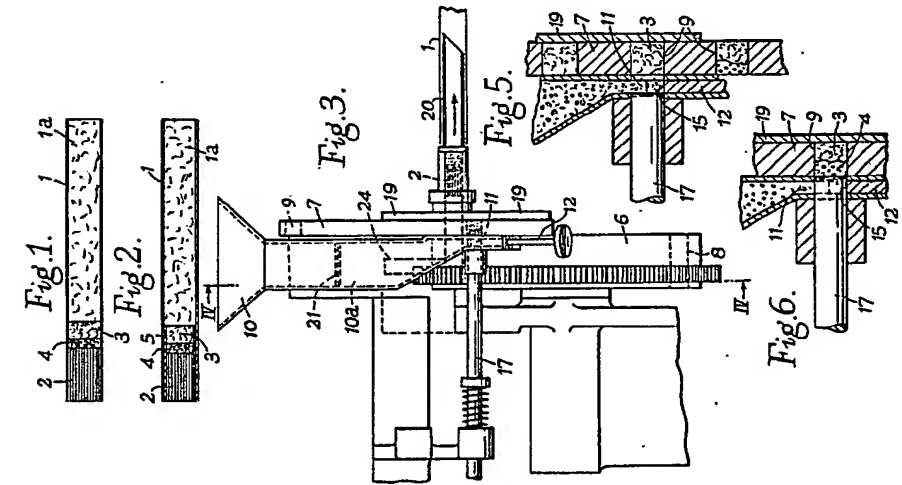
SHEETS 1 & 2

*Fig.4.*



*Fig.7.*





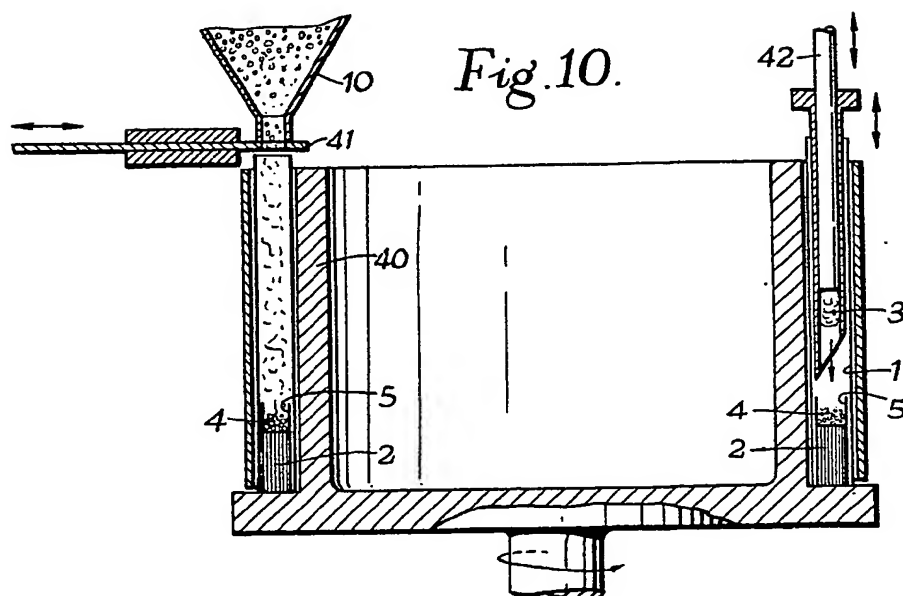
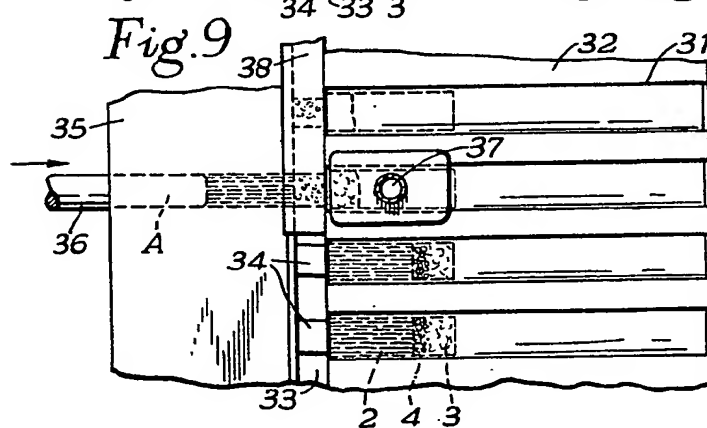
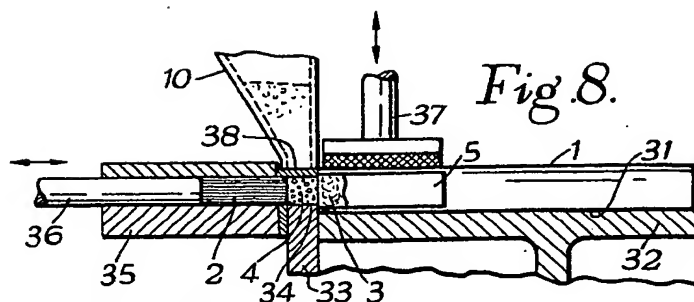




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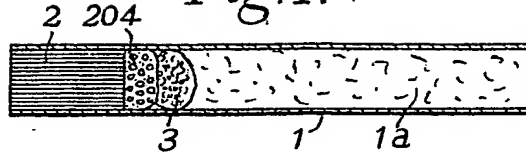


Fig.2.

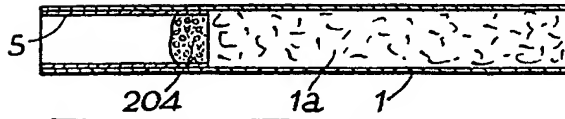


Fig.4.

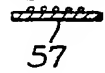


Fig.5.



Fig.3.

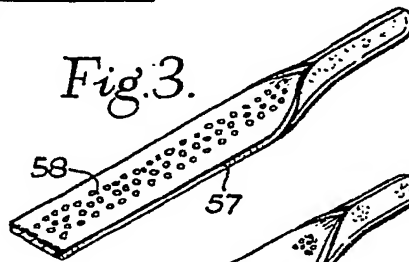


Fig.7.

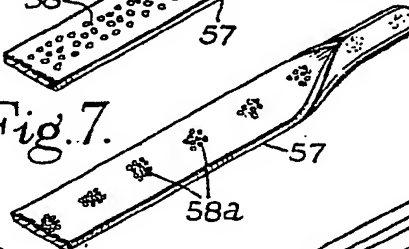


Fig.9.

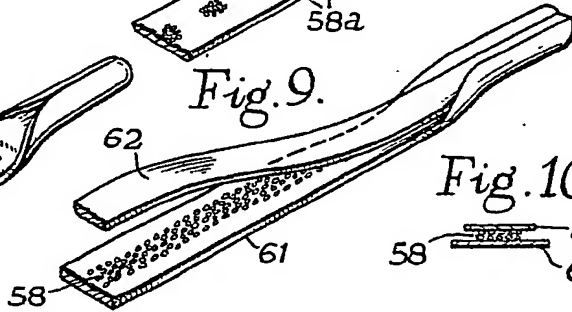


Fig.10.



Fig.8.

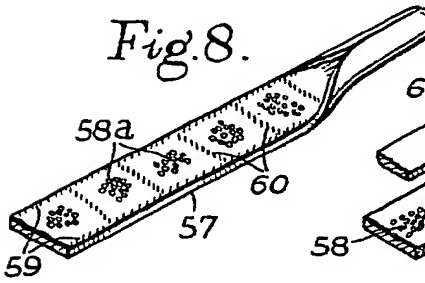


Fig.11.

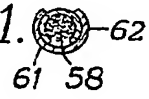


Fig.12.

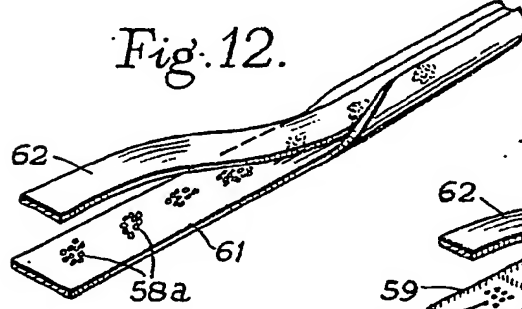


Fig.13.

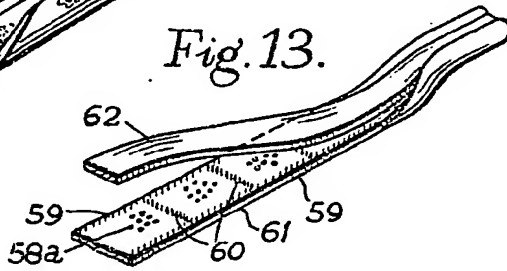


Fig. 14.

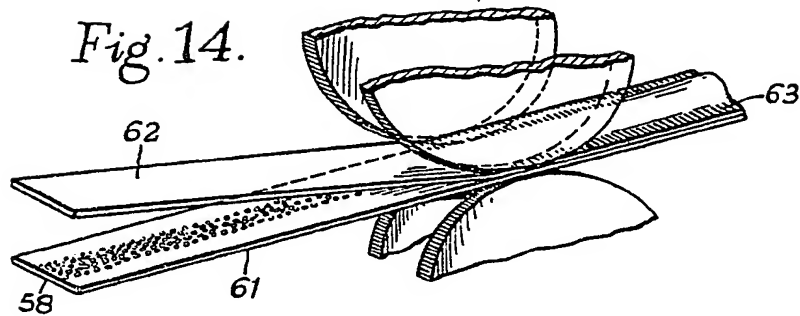


Fig. 15.

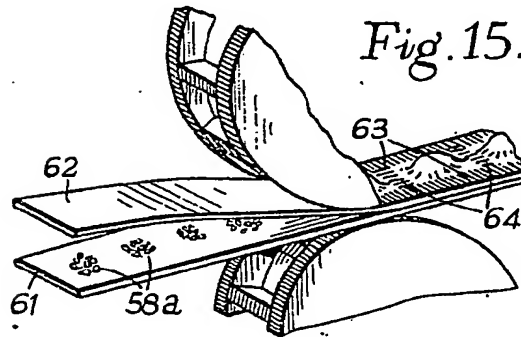


Fig. 16.

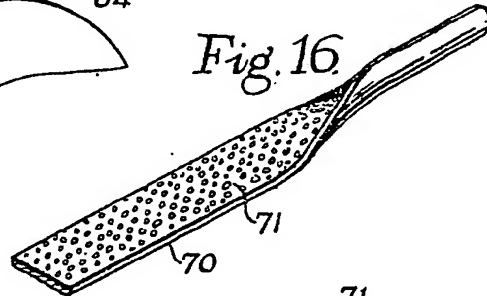


Fig. 17.



Fig. 18.



Fig. 19.

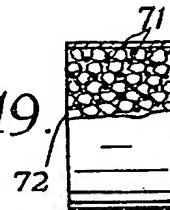


Fig. 20.

